

## (12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
21 October 2004 (21.10.2004)

PCT

(10) International Publication Number  
**WO 2004/090936 A2**

- (51) International Patent Classification<sup>7</sup>: **H01L** (74) Agent: **SEPPO LAINE OY**; Itämerenkatu 3 B, FI-00180 Helsinki (FI).
- (21) International Application Number: **PCT/FI2004/000224** (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (22) International Filing Date: 13 April 2004 (13.04.2004)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
60/461,820 11 April 2003 (11.04.2003) US
- (71) Applicants (for all designated States except US): **SILECS OY** [FI/FI]; Tietotie 3, FI-02150 Espoo (FI). **PAULASAARI, Jyri** [FI/FI]; Reelinkikatu 14 B 10, FI-20810 Turku (FI). **PIETIKÄINEN, Jarkko** [FI/FI]; Mannerheimintie 35 B 34, FI-00250 Helsinki (FI). **TÖRMÄNEN, Teemu** [FI/FI]; Eestintaival 3 A 1, FI-02280 Espoo (FI). **HACKER, Nigel** [GB/FI]; Suotorpantie 15 J 31, FI-02130 Espoo (FI). **VISWANATHAN, Nungavaram** [IN/US]; 6427 Trinidad Drive, San Jose, CA 95120 (US).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): **RANTALA, Juha** [FI/FI]; Tietotie 3, FI-02150 Espoo (FI).
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:  
— without international search report and to be republished upon receipt of that report
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **LOW-K DIELECTRIC MATERIAL**

(57) Abstract: The present invention relates to thin films suitable as dielectrics in integrated circuits and for other similar applications and to methods for the production thereof. In particular, the invention concerns thin films comprising at least partially cross-linked siloxane structures obtainable by hydrolysis of one or more silicon compounds of the general formula  $R_1-R_2-Si-(X_1)_3$ , wherein  $X_1$  is a leaving group,  $R_2$  is a cycloalkyl having from 3 to 16 carbon atoms, an aryl having from 5 to 18 carbon atoms or a polycyclic alkyl group having from 7 to 16 carbon atoms, and  $R_1$  is a substituent of  $R_2$  selected from alkyl groups having from 1 to 4 carbon atoms, alkenyl groups having from 2 to 5 carbon atoms, alkynyl groups having from 2 to 5 carbon atoms, and aromatic groups having 5 or 6 carbon atoms, each of said groups being optionally substituted, and Cl and F.

WO 2004/090936 A2